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The views expressed in this paper are those of the authors.
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Abstract

Of particular concern to monetary policy-makers is the considerable unreliability of financial variables for predicting GDP growth and inflation. As Stock and Watson (2003) find, some financial variables work well in some countries or over some time periods and forecast horizons, but the results do not show any clear pattern. This may be caused by the changing nature of financial structures within countries across time, or the differing types of financial structures across countries. The authors assess the extent to which financial structure across countries influences the information content of financial variables for predicting real GDP growth and inflation. Their assumption is that financial asset prices will dominate financial quantities in economies with highly developed market-based financial systems.

The authors use standard methods to determine the predictive content of common financial asset prices and quantities for 29 countries. They find no systematic pattern between financial structure and whether financial asset prices or quantities are the best financial indicators for monetary policy. Importantly, financial quantities are sometimes the best financial indicator, even in economies with highly developed market-based financial systems. The authors conclude that it would be difficult to tell, a priori, whether a financial asset price or quantity would be the best indicator for monetary policy for a particular country at a particular point in time.

JEL classification: E31, E32
Bank classification: Inflation and prices; Business fluctuations and cycles; Credit and credit aggregates; Monetary aggregates; Interest rates

Résumé

Le fait que les variables financières ne permettent pas de prédire avec fiabilité la croissance du PIB et de l'inflation complique la tâche des responsables de la politique monétaire. Comme Stock et Watson (2003) l'ont constaté, certaines variables financières constituent de bons indicateurs dans le cas de pays particuliers, sur des périodes données ou à des horizons de prévision déterminés, mais les résultats ne présentent pas de caractère systématique. L'une des raisons avancées est que la structure financière d'une économie peut varier aussi bien dans le temps que d'un pays à l'autre. Les auteurs évaluent la mesure dans laquelle la structure financière d'un pays influe sur la valeur prédictive des variables financières à l'égard de la croissance du PIB réel et de l'inflation. Leur hypothèse de départ est que les prix des actifs financiers sont de meilleurs indicateurs que les variables financières quantitatives dans le cas des économies dotées de systèmes financiers très développés et fondés sur les marchés.

Les auteurs ont recours aux méthodes usuelles pour déterminer la valeur prédictive, pour 29 pays différents, de prix d'actifs financiers et de variables financières quantitatives couramment utilisés. Ils n'observent aucune relation systématique entre la structure financière et le fait que les prix des actifs ou, au contraire, les variables quantitatives se révèlent de meilleurs indicateurs financiers aux fins de la conduite de la politique monétaire. Fait remarquable, les variables quantitatives constituent parfois le meilleur indicateur même dans le cas d'économies pourvues de systèmes financiers très développés et fondés sur le marché. Les auteurs concluent qu'il est difficile d'établir a priori si le prix d'un actif financier plutôt qu'une variable quantitative serait un meilleur indicateur pour un pays déterminé à un moment précis.

Classification JEL : E31, E32
Classification de la Banque : Inflation et prix; Cycles et fluctuations économiques; Crédit et agrégats du crédit; Agrégats monétaires; Taux d'intérêt

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1. Introduction

Monetary policy works with long and variable lags. Because of these lags, policy-makers need forward-looking indicators to predict the effect of policy changes on their intermediate and final target variables. The most useful indicators are those whose predictive capacity is invariant to changes in economic structure and to the state of the economic cycle. Unfortunately, few such indicators exist. A second-best solution is to determine how the predictive power of an indicator changes as economic structure or the state of the cycle changes. One can use this information to determine which set of indicators is more likely to be reliable in a given circumstance.

Of particular concern in the transmission of monetary policy is the considerable unreliability of financial variables for predicting GDP growth and inflation. As Stock and Watson (2003) find, some financial variables work well in some countries or over some time periods and forecast horizons, but the results do not show any clear pattern. One reason for this may be the changing nature of financial structures within countries across time, or the differing types of financial structures across countries. For example, one could speculate that the poor performance of monetary aggregates as indicators for monetary policy in the United States is due in part to the fact that their financial markets are highly developed, very complete, and efficient, so that financial asset prices contain all the information that monetary policy needs.

There are two reasons why asset prices may not always contain all of the information that monetary policy needs. First, prices may be informationally inefficient when financial markets are not well developed, such that informational frictions exist, with the result that contracts are not always enforceable (Smith 1999). Second, financial prices do not reveal everything when financial frictions result in incomplete financial markets. In particular, credit may be rationed in this case, because of the residual imperfect information that persists even after financial institutions examine loan applications (Stiglitz and Weiss 1981). This imperfect information about the value of projects can cause creditors to deny loans to borrowers who appear to be equivalent to those who receive loans, and hence loan demand can be greater than loan supply at the

equilibrium interest rate. It is reasonable to believe that financial institutions make more use of quantity rationing than financial markets, which may be more likely to allocate credit using price rationing. If financial institutions use quantity rationing but financial markets use price rationing, we should find that financial asset prices provide better indicators for monetary policy in countries where a greater proportion of credit is allocated through financial markets. Conversely, quantity indicators constructed from the balance sheet data of financial institutions should be more useful in countries where borrowers have more limited access to, or make more limited use of, financial markets.

Our methodology is as follows. Two common targets for monetary policy are selected for 29 countries: fluctuations in GDP, which we view as an intermediate target; and CPI inflation, which we view as a final target. For each country, we select up to four commonly used financial quantity variables and up to four commonly used asset-price variables. We choose variables for which data are readily available in the belief that these are the variables most likely used by policy analysts in that country. We then use Stock and Watson's (2003) procedure to determine the power of each variable as an indicator of the target variable for time horizons up to and including 8 quarters ahead. Finally, we test whether the best financial quantity indicator for a country contains information about the future path of the target variable beyond that contained in the best asset-price indicator.

In the second stage of the study, we use financial structure indexes and financial development indexes constructed by Levine (2002) to classify countries according to the nature of their financial structures. Levine has constructed two financial structure indexes: one based on the relative size of financial markets (namely, the market capitalization of exchange-traded companies relative to bank credit outstanding), and the other based on the relative intensity of activity in financial markets (namely, the volume of equity traded on the stock exchange relative to bank credit outstanding). The financial development indexes measure the activity, size, and efficiency of the financial system as a whole. We also examine the regulatory and legal environment in which financial institutions in a country operate, based on indexes developed by Levine (2002) and Ergungor (2003), respectively. We expect that market-based asset prices will be better indicators (i.e., contain relatively more information) in financial systems that have less

onerous regulatory restrictions and legal environments that strongly support the property rights of investors. The financial structure and financial development indexes are compared with the relative information content of financial quantities and asset prices to determine whether the two are related across countries.

Section 2 briefly reviews the relevant literature on financial structure and the economy. Section 3 describes the different ways in which financial structure is measured. Section 4 outlines the data and methodology used to extract a measure of the information content of financial variables. The results are discussed in section 5. Section 6 offers some conclusions.

2. Related Literature

If asset markets are informationally efficient, then they "work as a perfect shorthand for society's collective knowledge regarding the future" (Smith 1999). That is, they reflect all relevant information about expected future events. In addition, if financial transactions follow passively from real decisions, then financial quantities contain no information about the future that is not already contained in real variables or asset prices. Under these conditions, asset prices contain all the financial information that monetary policy needs about the future. If financial quantities matter, it is because financial markets are not informationally efficient, or because financial transactions do not passively reflect real decisions.

Financial markets may not be efficient if transactions costs or other frictions make it too expensive for financial market participants to act fully on the information at their disposal (Grossman 1976). Another possibility is that information is simply costly to obtain and therefore prices do not reflect all available information (Grossman and Stiglitz 1980).

Financial transactions might not passively reflect real decisions—that is, financial considerations might constrain real behaviour—for a variety of reasons. It may be that credit is rationed such that firms cannot obtain all the credit they need to realize their real decisions at current asset prices (Stiglitz and Weiss 1981). In this case,

an increase in the quantity of available credit at unchanged asset prices would cause firms to expand their activities owing to the relaxation of the credit constraint. Alternatively, it may be that economic agents face liquidity constraints that limit their ability to realize their optimal real plans (Lucas 1980). In this case, an increase in the quantity of money at unchanged asset prices would cause an increase in economic activity. As another possibility, a financial accelerator may be at work in the economy (Bernanke, Gertler, and Gilchrist 1999). In each of these cases, financial quantities contain information about the dynamic path of the economy beyond that contained in asset prices, because financial quantities reflect financial restrictions on the real behaviour of firms. Finally, money may be active (Laidler 1999) such that an increase in the quantity of money causes economic agents to change their real behaviour, because it signals easier monetary policy.

Financial markets are more likely to be informationally inefficient and real decisions are more likely to be constrained by financial considerations when the financial sector of an economy in general, or the financial market in particular, is underdeveloped. Allen and Gale (2001) survey the literature on the effects of underdeveloped financial systems on economic growth. The early literature points to the conclusion that a well-developed banking sector promotes growth in the early stages of development and well-developed financial markets promote growth in the later stages of development. More recent studies find evidence that the distinction between banks and financial markets is not important and that both promote growth if they are developed to the point where they provide all the financial services that savers and investors demand (Levine 2002). A modern and highly developed legal system is most likely the primary determinant of how well a financial system develops (La Porta et al. 1998).

Thus, the literature suggests that there may be a connection between financial structure and the information content of financial indicators. Specifically, where financial systems are underdeveloped (and likely bank based), financial markets are likely to be informationally inefficient and the ability of economic agents to realize real decisions is likely to be constrained by financial considerations. In such an economy,

financial quantities are more likely to be important indicators of future economic activity. On the other hand, in economies where financial systems are well developed, financial markets are more likely to be informationally efficient and sufficiently developed that financial considerations do not constrain real decisions in normal times. The question is whether the data support these theoretical suppositions.

There have been no studies, to our knowledge, that examine the connection between financial structure and the relative usefulness of financial indicators for monetary policy. Cecchetti and Krause (2001) study the related issue of whether financial structure affects the effectiveness of monetary policy; that is, the ease with which monetary policy can simultaneously reduce the variance of output and inflation. If financial structure matters for the effectiveness of monetary policy, it also matters for the relative information content of financial indicators. Cecchetti and Krause examine 23 developed and emerging-market countries and find that financial structure does affect the transmission of monetary policy. Specifically, countries with less direct state ownership of banking system assets have lower variances of both output and inflation, which suggests that the financial system is working more efficiently when there is private ownership of banks, thereby facilitating more efficient transmission of monetary policy.

Stock and Watson (2003) examine the relative information content of 38 indicators from seven developed economies. They find that the information content of these indicators varies over time and between countries. They do not, however, explore whether this variation in information content is related to differences in financial structure.

Allen and Gale (2001) and Dolar and Meh (2002), among others, study the evidence related to differences in financial structure and growth between countries over a long period of time. They find that, in general, financial structure does affect the aggregate growth trend of real economic variables. They do not, however, study the relationship between financial structure and the short-term fluctuations in output and inflation, which are of immediate concern in the transmission of monetary policy.

To examine whether financial structure matters for the information content of financial variables, we combine the techniques used by Stock and Watson (2003) and Levine (2002). We use high-frequency time-series data to ensure that the indicators are providing information about the future, as do Stock and Watson, and we use the measures of financial structure developed by Levine. We restrict our sample to a relatively short period of time, to limit the extent to which financial structure changed within individual countries.

3. Measuring Financial Structure

By financial structure we mean the nature of the components that make up a financial system. Allen and Gale (2001) identify these components as the agents in the system (that is, the ultimate suppliers and demanders of credit), financial institutions, financial markets, the central bank, the regulatory supervisor, the political system (that is, government and its policies), the legal system (in particular, contract enforcement and governance mechanisms), custom (that is, the importance of reputation and other implicit mechanisms for contract enforcement), accounting systems, and the nature of the incentives to generate and disseminate information.

For this study, we use the structure and development indexes constructed by Levine (2002). We are interested in the indexes that capture the size, activity, and efficiency of financial markets relative to financial institutions. To construct these indexes, Levine uses "data from individual country publications, international agencies, and a recent survey of national regulatory authorities."

Levine finds that the indexes he constructs do not help explain differences in long-term growth rates between countries. He posits that this result is due to the fact that both highly developed banks and financial markets are capable of providing the financial services that are important for growth. According to Levine, what does help explain differences in long-run growth is "the component of financial development explained by legal rights of outside investors and the efficiency of the legal system in enforcing those rights." Demirgüç-Kunt and Levine (1999) report that countries with a tradition of common law—which is thought to be more efficient at enforcing the legal rights of

outside investors—have been found to be more market based, while countries with a tradition of French civil law have been found to be more bank based, which suggests that the relative importance of financial markets in a financial system is not independent of the legal structure used by the system.

Not all researchers measure financial structure in the same way. Levine (2002) uses the traditional approach of constructing an index that reflects the aggregate size, activity, and efficiency of a country's financial institutions sector relative to its financial markets sector. Ergungor (2003) focuses on the legal structures that underpin the financial system. These are the most basic attributes of financial structure.

Cecchetti (1999) focuses on the structural aspects of the financial system that are more important for the transmission mechanism. He constructs an aggregate index of financial structure based on the financial variables that the lending view of the transmission mechanism suggests should be important: the size and concentration of the banking sector, the health of the banking system, the relative amount of credit allocated through banks, and the size of the firms that use banks. We do not use Cecchetti's approach, because he uses much fewer countries in his data set than does Levine.

Tadesse (2001) uses dummy variables to classify a financial system as either market based or bank based. If Levine's conglomerate index of size, activity, and efficiency for the financial system of a country is above the mean value of the index, then Tadesse classifies the country as having a bank-based financial system. If the index is below the mean, then Tadesse classifies the financial system as market based. Thus, the research provides a relative, not absolute, metric of this financial system characteristic. We apply this approach to the indexes we consider.

Andrés, Hernando, and López-Salido (1999) take a highly disaggregated approach to identifying financial structure. They do not classify financial structure in aggregate, but use a wide selection of separate variables for the financial market structure for each country. We do not follow their approach because including a wide range of structure indicators consumes many degrees of freedom, and because we want to use financial

market variables as indicators for monetary policy, which precludes their use as indicators for financial structure.

Mojon (2000) also uses a highly disaggregated approach to identify financial structure, but with a broader selection of structural variables, such as the heterogeneity of retail banking markets and balance sheet variables from non-financial firms and households. These variables are not among those we examine as potential financial indicators for monetary policy. Mojon's approach also consumes too many degrees of freedom to be feasible with our limited span of data.

4. Measuring the Predictive Content of Financial Variables

4.1 Data

Our data are taken from the databases of the Organisation for Economic Co-operation and Development (OECD), the International Monetary Fund (IMF), and the Bank for International Settlements (BIS); the data include 29 countries with as many as four asset prices and four financial quantities in nominal and real terms. These sources are used to ensure as much compatibility within the definitions as possible across countries. We include a large number of countries to ensure a wide variance in financial structure. We have attempted to make the sample periods as comparable as possible, although limitations of the data set mean that not all countries in our sample have data for all variables, and that sample sizes may vary across countries (see Appendix A for details).

As summarized in Table 1, the asset-price data are market based, including the monetary policy rate, the short-term rate (yield on a government treasury bill), the long-term rate (yield on a long-term government bond), and the index of equity prices from the dominant stock exchange. Quantity data are taken mainly from the balance sheet of financial institutions, and include the monetary aggregates M1 and M2, as well as credit extended by banks, and private credit extended by both markets and banks. These are the most commonly used financial data in studies of financial effects. The real values of the prices and quantities are constructed using the consumer price index (CPI), creating ex post real values.

Table 1: Series Descriptions

Series label	Source and sampling frequency	Definition
CPI	OECD, quarterly	Consumer price inflation
RGDP	OECD, quarterly	Real GDP
Financial prices*		
POL	IMF, quarterly	Policy rate
TBILL	IMF, quarterly	Treasury bill rate
GY	IMF, quarterly	Gov't long-bond yield
ST	OECD, quarterly	Stock index
Financial quantities*		
M1	IMF, quarterly	Narrow money
M2	IMF, quarterly	Broad money
PC	IMF, quarterly	Private credit
BC	BIS, quarterly & monthly	Bank credit

* Both nominal and ex post real data are tested.

Unit root tests applied to the levels of all series indicate, as expected, mixed evidence on the stationarity of a few series. The evidence varies across test, time period, and country. For example, while M1 is unambiguously I(1) for some of the countries, the results of the test are not definitive for other countries. Even results for the same country can be ambiguous. For example, for Argentina, M1 is clearly I(1), while M2 can be identified as either an I(1) or I(2) process. For simplicity, and to ensure consistency across countries, we treat all variables except interest rates as I(1). Repeating the exercise with variables treated as I(2) does not significantly change the qualitative nature of our results.

4.2 Methodology

We follow the methodology used by Stock and Watson (2003), largely because it is a widely accepted and commonly used method of extracting information from a large set of data, and it facilitates comparisons with other results in the literature. The approach

assumes that the target variables are linear functions of the indicator variables, according to the following general equation[1]:

$$\Delta y_{t+h}^{h} = \alpha + \beta(L)\Delta y_{t-1} + \gamma(L)\Delta x_{t-1} + \xi_t, \tag{1}$$

where Δy_{t+h}^{h} is the target variable (the variable that we want to predict) at different forecast horizons, $h = 4$ and 8 quarters, and x_t is the indicator variable. Variables are transformed by taking the log difference from one period to the next (i.e., $\Delta y_{t+h}^{h} = (400/h)(y_{t+h} - y_t)$). $\beta(L)$ and $\gamma(L)$ are lag polynomials.

Lagged values of Δy_t are included as explanatory variables to account for serial correlation and to avoid misspecification problems. The benchmark equation is simply the identical equation without the indicator variable:

$$\Delta y_{t+h}^{h} = \alpha_1 + \beta_1(L)\Delta y_{t-1} + \xi_{1t}. \tag{2}$$

Equations (1) and (2) are estimated separately for each country and for each x variable. White's (1980) correction is applied to the variance-covariance matrix of the residuals to correct the error term for serial correlation and heteroscedasticity by calculating a consistent variance-covariance matrix. The typical estimation period is from 1990Q1 to 2003Q1 (see Appendix A for details), even though longer time horizons are available for some countries. The choice of sample length is based on three considerations: first, we want to estimate over a period close to that corresponding to the financial structure indicators we use; second, we want to maximize the number of countries and variables in the analysis; and, third, we want to obtain a common sample period across countries, to avoid the possibility that the results will be driven by heterogeneous samples.[2]

[1] Stock and Watson (2003) identify nonlinearity in the predictive relationship as a potential explanation for instability and uneven predictive content of financial variables, but conclude that the evidence is mixed that forecasting performance is improved by taking such nonlinearities into account.

[2] The exercise is repeated using the maximum sample available for each country without any significant change to the qualitative results.

For each country, we measure the information content of each indicator, x, at horizons h = 4 and 8 quarters, as the difference between $R^2_{h,AU,3}$ (the R^2 from equation (1)) and $R^2_{h,2}$ (the R^2 from the benchmark equation). $R^2_{h,AU,3} - R^2_{h,2}$ is set to zero whenever the F-test shows that the residuals from both equations (1) and (2) are not statistically different at the 5 per cent level. If $R^2_{h,AU,3} - R^2_{h,2}$ is different from zero, we conclude that x_t contains information useful for predicting the target variable, Δy_t. From these results, we compare the different $R^2_{h,AU,3} - R^2_{h,2}$ of every financial quantity variable and choose the one that adds the most for forecasting GDP growth or inflation, at each horizon. We also do this for the financial asset-price variables. Thus, for every country, we identify the best quantity variable and the best asset-price variable for predicting GDP growth and inflation. The results are detailed in Appendixes B and D for forecast horizons 4 and 8 quarters ahead, respectively.

We construct a second measure of predictive content that focuses on the value-added of the best quantity variable relative to the best price variable. We estimate equation (3), where x^*_p denotes the best asset-price variable and x^*_q denotes the best financial quantity variable (selected from the first step):

$$\Delta y^h_{t+h} = \alpha_2 + \beta_2(L)\Delta y_{t-1} + \gamma_2(L)\Delta x^*_{q,t-1} + \phi_2 x^*_{p,t-1} + \varepsilon_{2t}. \qquad (3)$$

We then calculate the $R^2_{h,AU,3} - R^2_{h,2}$ using the R^2s from equation (3) and the R^2s from equation (1) for the best price.[3] The results are presented in Appendixes C and E for forecast horizons 4 and 8 quarters ahead, respectively.

5. Results

This section first describes the information content of asset prices and financial quantities and tries to find patterns in those results with measures of the countries'

[3] We base our results on in-sample measures of fit, primarily because of our short sample length. As well, Inoue and Kilian (2002) and Kilian and Taylor (2001) show that in-sample tests of predictive ability have more power than out-of-sample tests.

financial structure. Tables 2a and b summarize the number of times, and the proportion of our cross-section, in which financial variables contain significant information. Detailed results used to construct these tables are provided in Appendixes B and D, respectively.

Table 2a: Number of Times Variables Contain Significant Information, h=4

	Real GDP Growth			Inflation			No. of countries in sample
Variable	Sum	Number of countries	Proportion	Sum	Number of countries	Proportion	
Financial quantity:							
BC	22	2	11	23	3	17	18
M1		7	29		9	31	29
M2		6	26		6	21	28
PC		7	24		5	17	29
Financial price:							
GY	17	2	11	13	3	16	19
POL		2	7		3	11	28
ST		7	25		2	7	28
T-bill		6	22		5	19	27

5.1 Financial quantities

Regarding GDP growth, there are only five countries (Argentina, Greece, Mexico, Turkey, and the United States) where none of our financial quantity variables contains useful information. Moreover, monetary aggregates are the best financial quantity indicators in around 45 per cent of the countries at 4 quarters ahead and in 36 per cent of the countries at 8 quarters ahead. While private credit and bank credit are, respectively, the best indicators in 24 per cent and 11 per cent of the countries at 4 quarters ahead, the proportion for private credit grows to 34 per cent of countries at 8 quarters ahead (Tables B1 and D1 in Appendixes B and D, respectively). On average, money improves the $\overline{R}^2$ of the equation for GDP growth by 25 percentage points at 4 quarters ahead and by 34 percentage points at 8 quarters ahead. Comparable results are obtained for bank credit

and private credit. The improvement in the $\overline{R}^2$ lies between 22 and 33 percentage points (on average) for credit variables (bank credit and private credit), respectively, at 4- and 8-quarter horizons. The marginal improvement in the $\overline{R}^2$ of GDP growth increases with the horizon length.

Table 2b: Number of Times Variables Contain Significant Information, *h*=8

	Real GDP Growth			Inflation			No. of countries in sample
Variable	Sum	Number of countries	Variable	Sum	Number of countries	Variable	
Financial quantity:							
BC	22	2	11	23	4	22	18
M1		6	21		8	28	29
M2		4	15		4	15	27
PC		10	34		7	24	29
Financial price:							
GY	21	3	16	15	1	5	19
POL		2	7		6	21	28
ST		12	43		4	14	28
T-bill		4	15		4	15	27

Regarding inflation, financial quantity variables are useful indicators in 23 of 29 countries. Monetary aggregates are the most useful variables, over all the countries, in predicting inflation. At 4 quarters ahead, money is the best variable in 52 per cent of the countries and bank credit is the best financial quantity indicator in 17 per cent of the countries (Tables B2 and D2). Credit and money improve the $\overline{R}^2$ by 32 and 17 percentage points, respectively, at 4 quarters ahead, and by 27 and 26 percentage points at 8 quarters ahead. The marginal improvements are largest for money at the 8-quarter horizon, and for credit at the 4-quarter horizon.

5.2 Financial asset prices

As indicators of GDP growth, asset prices perform about as well as financial quantities at 8 quarters ahead, but less well at 4 quarters ahead. Asset prices are useful indicators in 17 countries at 4 quarters ahead and in 21 countries at 8 quarters ahead. Although the potential information content of stock prices and their usefulness for monetary policy are a matter of debate, our results show that stock prices are the best asset-price indicator for GDP growth for 25 per cent of the countries at 4 quarters ahead, and for 12 per cent of the countries at 8 quarters ahead (Tables B1 and D1). At 4 quarters ahead, for 22 per cent of the countries, treasury bills are the best asset-price predictor, followed by government bond yields in 11 per cent of the countries. Over both horizons, stock indexes and the government bond yield improve the $\overline{R}^2$ of our equations by 25 percentage points, on average. The policy rate and the treasury bill yield improve the forecasts by 20 percentage points, on average, over both horizons. At 4 quarters ahead, the government bond yield and stock indexes outperform policy rates or treasury bills. At 8 quarters ahead, however, all the asset-price variables perform equally well.

For inflation, financial asset prices contain significant information for 13 countries at 4 quarters ahead, and for 15 countries at 8 quarters ahead. Policy variables and treasury bills are the best asset-price variables in 17 per cent of the countries, on average, over both horizons. Stock prices outperform in only 11 per cent of the countries over both horizons, being more informative at 8 than at 4 quarters ahead (Tables B2 and D2). The government bond yield is the best predictor variable for inflation in 16 per cent of the countries at 4 quarters ahead, but in only 5 per cent of the countries at 8 quarters ahead.

In summary, our results indicate that both asset prices and financial quantities contain potentially useful information for the future path of GDP and inflation, consistent with Stock and Watson (2003) and other studies. In our sample, no single financial variable dominates as the best indicator for monetary policy. This result suggests that it is important to know the conditions under which one financial variable will outperform another as an indicator of monetary policy.

5.3 Value-added of financial quantities over asset prices

While asset prices and financial quantities individually may contain useful information, we are also interested in learning whether financial quantities contain information beyond that contained in asset prices for predicting GDP growth and inflation.

For GDP growth, financial quantities contain information beyond asset prices for 11 countries at 4 quarters and 16 countries at 8 quarters, which suggests that financial quantity information is potentially useful in many circumstances (Tables C1 and E1). However, financial quantities improve the $\overline{R}^2$ of GDP by only 6 percentage points, on average, over both horizons—not a large amount.

For inflation, financial quantities improve forecasts beyond those based on asset prices alone in 21 countries. The value-added of financial quantities appears to be important, improving the $\overline{R}^2$ by 17 percentage points, on average, over both horizons.

There are twelve countries in which financial quantities do not help in predicting GDP growth better than asset prices (Argentina, Belgium, Chile, Denmark, Germany, Greece, Japan, Malaysia, Mexico, the Netherlands, Turkey, and the United States) over both horizons. For inflation, however, there are only four countries (Belgium, France, Ireland, and Sweden) where financial quantity variables do not improve inflation forecasts over the best asset-price variable. The lack of commonality between the lists suggests that finding the conditions under which one financial indicator will be better than another will not be easy.

5.4 Financial structure and the relative predictive content of financial variables

To link our results to countries' financial structures, we consider four indexes that characterize the financial environment in the economies considered. Appendix F provides details on how we categorize countries based on these indexes. The first three indexes of financial development, organization, and regulation and are taken from Levine (2002). The financial development indexes aim to measure the degree of development of the overall financial system by measuring its activity, size, and efficiency. The financial

organization index aims to measure the degree to which financial structure is market based or bank based, by measuring the relative activity, size, and efficiency of each sector. The financial regulation index, also taken from Levine, measures the regulatory restrictions on commercial bank activities in fields such as real estate, insurance, and securities. The fourth indicator identifies countries as having low legal flexibility if judges have little latitude in interpreting legal statutes (Ergungor 2003).

To conduct our analysis, we relate the financial variables used (asset prices and financial quantities) to the indexes of financial structures of the economy. Tables 3 and 4 measure the relative importance of asset prices and quantities as indicators of GDP and inflation, respectively, by different financial structure types. These tables show the results for the two forecast horizons combined, but the individual results for the 4- and 8-quarter-ahead horizons are qualitatively similar. For example, in bank-based economies, asset prices are the best indicators for GDP growth in just 25 per cent of the countries, while financial quantities are best in 65 per cent of the countries (no financial indicator is found to be useful in 10 per cent of the countries tested).

Table 3: Proportion of Times that a Variable is the Best Indicator of Real GDP Growth in Relation to a Specific Financial Index, combined horizons

	Financial organization		Financial development		Financial regulation		Legal structure	
	Bank	Market	Less	More	Heavy	Light	Low	High
Asset prices	25	34	33	30	41	23	28	33
Financial quantities	65	55	50	62.5	45	67	60	56

Table 4: Proportion of Times that a Variable is the Best Indicator of Inflation in Relation to a Specific Financial Index, combined horizons

	Financial organization		Financial development		Financial regulation		Legal structure	
	Bank	Market	Less	More	Heavy	Light	Low	High
Asset prices	25	23	22	25	20	26	21	26
Financial quantities	60	68	61	68	66	64	71	60

Financial quantities appear to be important indicators no matter what the financial structure of an economy is, for GDP growth and inflation. Notably, financial asset prices are not systematically more important in economies with highly developed market-based financial systems. Even in these economies, financial quantities are the best financial indicators in more than 60 per cent of the countries, which is somewhat surprising, given our hypothesis.

One shortcoming of our analysis is that we rely simply on whether a variable contains information, which may be overly restrictive if the *degree* to which financial variables contain information varies significantly across countries. One way around this shortcoming would be to specify a system of equations (seemingly unrelated regression or panel), and then study the mean effect and specific effect. This would also allow us to examine the information content of variables over several horizons together, rather than separately. One could also construct a common distribution for all countries, assessing the information content of financial variables on GDP growth and inflation by drawing cross-country comparisons.

6. Conclusion

In this paper, we have aimed to determine the extent to which financial structure influences the information content of financial variables for predicting real GDP growth and inflation. Our assumption was that asset prices would dominate financial quantities in economies with highly developed market-based financial systems.

Concentrating on the period 1920–2003, we examined data from 29 countries using GDP growth and inflation as target variables for monetary policy, and using a variety of readily available financial asset prices and quantities as indicators. We used the methodology of Stock and Watson (2003) to identify the marginal information content for our financial indicators.

We have found that financial asset prices do not, in general, dominate financial quantities as an indicator for monetary policy. Financial quantities are the best single indicator for monetary policy in approximately as many countries as a financial asset

price, although asset prices do seem to provide more information at the margin, on average, than do financial quantities. These results hold for both GDP growth and inflation. In a significant majority of countries, financial quantities contain information useful for monetary policy beyond that contained in asset prices. We found no systematic pattern between financial structure and whether financial asset prices or quantities were the best financial indicator for monetary policy. Importantly, financial quantities were sometimes the best financial indicator even in countries with highly developed financial market-based financial systems.

These results lead us to conclude that it would be difficult to tell, a priori, whether a financial asset price or quantity would be the best indicator for monetary policy in a particular country and at any particular point in time. One reason why we did not find a clear relationship between the indicator properties of financial variables and financial structure may be that our measures of financial system structure are too simple to capture the aspects of it that are important for the transmission mechanism. In addition, our study is limited because it considered only changes in financial structure across countries. It may be easier to find the connections between financial structure and the indicator properties of financial variables by examining how financial structure changes within an economy through time, in addition to examining how financial structure differs between economies at a point in time.

Despite these limitations, our study does show that financial quantity variables may sometimes be good indicators for monetary policy, whatever the financial structure of an economy. We have not, however, identified the conditions under which one financial indicator is better than another. That is left for future research.

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Appendix A: Data Sources and Samples

Table A1: GDP, CPI, and Price Variables

	OECD etsintoecd	IMF "etsintimf"		OECD etsintoecd	IMF "etsintimf"		BIS "etsintbis"
	Economic Variables			Prices			
	CP (CPIII	Real GDP (GDP)	Policy rate (POL)	Stock index (ST)	T-bill rate (Tbill)	Govt bond yield (GY)	Residential property prices (HP)
Country	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Quarterly	Various
Argentina	1957-2003	1993-2002	1988-2003	1993-2003	1979-2003	1998-2003	NA
Australia	1960-2003	1959-2003	1969-1996	1960-2003	1969-2002	1957-2003	q 1986-2003
Austria	1960-2003	1976-2003	1957-1998	1968-2003	1967-1998	1970-2000	1960-2003
Belgium	1960-2003	1980-2002	1957-1998	1985-2003	1957-2003	1957-2003	q 1981-2003
Brazil	1980-2003	1990-2002	1957-2003	1980-2003	1995-2003	1998-2003	NA
Canada	1960-2003	1961-2002	1957-2003	1960-2003	1957-2003	1957-2003	m 1980-2003
Chile	1957-2003	1980-2003	1993-2003	1974-2003	2000-2003	NA	NA
Denmark	1960-2003	1988-2003	1957-2003	1983-2003	1972-2003	1957-2003	q 1971-2003
Finland	1960-2003	1960-2003	1957-1998	1987-2003	1981-2003	1993-2003	q 1978-2003
France	1960-2003	1970-2003	1969-2003	1960-2003	1970-2002	1957-2003	q 1994-2003
Germany	1960-2003	1960-2003	1957-1998	1960-2003	1975-2003	1957-2003	a 1975-2003
Greece	1960-2003	1948-2002	1957-2000	1985-2003	1983-2003	1985-2003	q 1994-2003
Hong Kong	1980-2003	1986-2002	1992-2003	1994-2003	1992-2003	NA	m 1993-2003
Iceland	1959-2003	1962-1997	1957-2003	1993-2003	1984-2003	1992-2003	1993-2002
Indonesia	1968-2003	1997-2001	1990-2003	1995-2003	1974-2003	NA	NA
Ireland	1960-2003	1997-2002	1957-1998	1960-2003	1973-1998	1957-1998	q 1988-2003
Israel	1957-2003	1968-2003	1982-2003	1957-2003	1984-2003	NA	NA
Italy	1960-2003	1960-2003	1964-1998	1975-2003	1977-2003	1957-2003	a 1970-1998
Japan	1960-2003	1957-2003	1957-2003	1960-2003	1980-2000	1966-2003	a 1970-1999
Korea	1970-2003	1970-2002	1957-2003	1981-2003	1976-2003	1973-2003	1990-2003
Luxembourg	1957-2003	1995-2002	1990-1999	1980-1999	1980-1999	1970-1999	1995-2003
Malaysia	1957-2003	1991-2003	1959-1996	1991-2003	1974-2003	2002-2003	NA
Mexico	1957-2003	1980-2003	1981-2003	1984-2003	1978-2003	1995-2000	1980-2003
Netherlands	1960-2003	1977-2002	1957-1993	1983-2003	1960-1998	1957-2003	m 1999-2003
New Zealand	1957-2003	1987-2003	1957-2003	1961-2003	1978-2003	1957-2003	q 1962-2003
Norway	1960-2003	1979-2003	1957-2003	1986-2003	1978-2003	1957-2003	q 1991-2003
Philippines	1957-2003	1981-2003	1957-2003	1957-2003	1976-2003	1994-2003	NA
Portugal	1960-2003	1988-2003	1957-1998	1988-2003	1980-1998	1957-2000	m 1988-2003
South Africa	1957-2003	1960-2002	1957-2003	1957-2003	1957-2003	1957-2003	NA
Spain	1960-2003	1960-2003	1957-1998	1985-2003	1979-2003	1978-2003	q 1999-2003
Sweden	1960-2003	1990-2003	1957-2002	1960-2003	1961-2001	1957-1995	q 1986-2003
Switzerland	1960-2003	1967-2003	1957-2003	1960-2003	1980-2003	1957-2003	q 1970-2003
Turkey	1969-2003	1987-2003	1957-2003	1986-2003	1985-2003	1999-2003	1994-2003
United Kingdom	1960-2003	1957-2002	1985-2003	1960-2003	1957-2003	1957-2003	m 1983-2002
United States	1960-2003	1957-2003	1957-2003	1964-2003	1957-2003	1957-2003	m 1975-2002

Table A2: GDP, CPI, and Price Variables

	IMF "etsintimf"			BIS "etsintbis"
	Quantities			
	M1 (M1)	M2 (M2)	Private sector credit (PC)	Bank credit to business (BC)
Country	Quarterly	Quarterly	Quarterly	Various
Argentina	1957-2003	1957-2003	1957-2003	1957-2003
Australia	1960-2002	1957-2002	1957-2002	1976-2003
Austria	1960-1998	1958-1998	1958-1998	1999-2001
Belgium	1979-1998	1958-1998	1958-1998	NA
Brazil	1957-2003	1957-2003	1957-2003	1957-2003
Canada	1960-2003	1957-2002	1957-2002	m. 1956-2003
Chile	1960-2003	1960-2003	1960-2003	1960-2003
Denmark	1988-2003	1957-2003	1957-2003	m.1993-2003
Finland	1980-1998	1957-1998	1957-1998	NA
France	1977-1998	1957-1998	1957-1998	q.1977-1998
Germany	1960-1998	1957-2003	1957-1998	q.1968-1997
Greece	1957-2000	1957-2000	1957-2000	m.1980-2003
Hong Kong	1991-2003	1991-2003	1990-2003	1990-2003
Iceland	1957-2003	1957-2003	1957-2003	1957-2003
Indonesia	1967-2003	1968-2003	1968-2003	1980-2003
Ireland	1960-1998	1982-1998	1957-1998	NA
Israel	1957-2003	1957-2003	1957-2003	1957-2003
Italy	1974-1998	1974-2003	1970-1998	NA
Japan	1960-2003	1957-2003	1957-2002	q.1992-2003
Korea	1960-2003	1960-2003	1957-2003	NA
Luxembourg	1983-2003	1957-2003	1977-2003	1957-2003
Malaysia	1957-2003	1957-2003	1957-2003	1957-2003
Mexico	1957-2003	1957-2003	1957-2003	1957-2003
Netherlands	1960-1998	1959-1997	1957-1997	1999-2003
New Zealand	1957-2003	1957-2003	1957-2003	1957-2003
Norway	1992-2003	1957-2003	1957-2003	NA
Philippines	1957-2003	1957-2003	1957-2003	1957-2003
Portugal	1966-1998	1957-1998	1957-1998	NA
South Africa	1965-2003	1971-2003	1971-2003	1971-2003
Spain	1962-1998	1961-1998	1957-1998	1999-2003
Sweden	NA	1960-2000	1969-2000	q.1976-2003
Switzerland	1960-2002	1957-2003	1957-2003	1976-2003
Turkey	1962-2003	1962-2003	1959-2003	1959-2003
United Kingdom	1963-1989	1982-2003	1959-2003	q.1975-2003
United States	1960-2003	1957-2002	1957-2002	w.1972-1996

Table A3: Sample Size and Variables Tested

	Sample retained	Variables tested	
		Price	Quantity
Argentina	1993Q1–2001Q1	TBILL	M1, M2, BC, PC
Australia	1990Q1–1996Q1	POL, TBILL, GY, ST	M1, M2, BC, PC
Austria	1990Q1–1998Q1	POL, TBILL, GY, ST	M1, M2, PC
Belgium	1990Q1–1998Q1	POL, GY, ST,TBILL	M1, M2, PC
Brazil	1993Q1–2002Q1	POL, ST	M1, M2, BC, PC
Canada	1990Q1–2003Q1	POL, TBILL, GY, ST	M1, M2, BC, PC
Chile	1993Q1–2003Q1	TBILL, ST, POL	M1, M2, BC, PC
Denmark	1993Q1–2003Q1	POL, TBILL, GY, ST	M1, M2, PC
Finland	1990Q1–1998Q1	POL, ST, TBILL	M1, M2, PC
France	1990Q1–1998Q1	POL, TBILL, GY, ST	M1, M2, BC, PC
Germany	1990Q1–1997Q3	POL, TBILL, GY, ST	M1, M2, BC, PC
Greece	1990Q1–2000Q4	POL, TBILL, ST	M1, M2, BC, PC
Ireland	1990Q1–1998Q1	POL, TBILL, GY, ST	M1, M2, PC
Israel	1990Q1–2003Q1	POL, TBILL, ST	M1, M2, BC, PC
Italy	1990Q4–1998Q4	POL, TBILL, GY, ST	M1, M2, PC
Japan	1990Q1–2000Q4	POL, TBILL, GY, ST	M1, M2, PC
Malaysia	1992Q1–2003Q1	POL, TBILL, ST	M1, M2, BC, PC
Mexico	1990Q1–2003Q1	POL, TBILL, ST	M1, M2, BC, PC
Netherlands	1990Q1–1997Q4	POL, TBILL, GY, ST	M1, M2, PC
New Zealand	1990Q1–2003Q1	POL, TBILL, GY, ST	M1, M2, BC, PC
Norway	1992Q1–2003Q1	POL, GY, ST, TBILL	M1, M2, PC
Philippines	1990Q1–001Q4	POL, TBILL, ST	M1, M2, BC, PC
South Africa	1992Q1–2003Q1	POL, TBILL, GY, ST	M1, M2, BC, PC
Spain	1990Q1–1998Q4	POL, TBILL, GY, ST	M1, M2, PC
Sweden	1990Q1–2000Q4	POL, TBILL, ST	M2, PC
Switzerland	1990Q1–2003Q1	POL, TBILL, GY, ST	M1, M2, PC
Turkey	1990Q1–2003Q1	POL, ST	M1, M2, BC, PC
UK	1990Q1–2002Q4	POL, TBILL, GY, ST	M1, M2, BC, PC
USA	1990Q1–2003Q1	POL, TBILL, GY, ST	M1, M2, BC, PC

Note: Variables for which there was insufficient or no data were excluded from the analysis.

Appendix B: Results from Augmented AR Regressions, 4 Quarters Ahead

Table B1: Measure of Marginal Information for Best Quantity and Price Variable for Predicting GDP Growth (1990–2003)

	Quantity var	Price var	Best quantity	Best price
Argentina	0	0	-	-
Australia	0.65	0.22	M2	P-L
Austria	0.18	0.17	M1	ST
Belgium	0.12	0	M1	-
Brazil	0.09	0	PC	-
Canada	0.3	0	M2	-
Chile	0.14	0.19	BC	ST
Denmark	0.1	0	M2	-
Finland	0.51	0.25	PC	GY
France	0.21	0.11	M2	Tbill
Germany	0.14	0.47	BC	Tbill
Greece	0	0.28	-	ST
Ireland	0.22	0.23	M1	ST
Israel	0.29	0	M2	-
Italy	0.56	0.28	PC	Tbill
Japan	0.1	0	M2	-
Malaysia	0	0	-	-
Mexico	0	0	-	-
Netherlands	0.35	0.41	PC	Tbill
New Zealand	0	0	-	-
Norway	0.11	0	PC	-
Philippines	0.12	0.22	M1	GY
South Africa	0.23	0	M1	-
Spain	0.31	0.24	M1	ST
Sweden	0.3	0.44	PC	ST
Switzerland	0.4	0.1	M1	P-L
Turkey	0	0.24	-	Tbill
United Kingdom	0.3	0.29	PC	Tbill
USA	0	0.13	-	ST

Note: "-" indicates no variable had significant predictive content.

Table B2: Measure of Marginal Information for Best Quantity and Price Variable for Predicting Inflation (1990–2003)

	Quantity var	Price var	Best quantity	Best price
Argentina	0.06	0	M1	-
Australia	0.23	0.53	M2	P-L
Austria	0.19	0.12	M2	Tbill
Belgium	0	0.14	-	ST
Brazil	0.21	0	M1	-
Canada	0.1	0.12	M1	P-L
Chile	0	0	-	-
Denmark	0.33	0	BC	-
Finland	0.12	0	PC	-
France	0	0.16	-	GY
Germany	0.64	0.29	BC	Tbill
Greece	0.03	0	PC	-
Ireland	0	0.08	-	Tbill
Israel	0.05	0	M1	-
Italy	0.07	0.06	M1	P-L
Japan	0.32	0	PC	-
Malaysia	0.37	0	PC	-
Mexico	0.11	0	M1	-
Netherlands	0.45	0.35	M2	ST
New Zealand	0.35	0	M1	-
Norway	0.03	0	M1	-
Philippines	0.21	0.09	M2	Tbill
South Africa	0.15	0.4	M2	GY
Spain	0	0	-	-
Sweden	0	0	-	-
Switzerland	0.19	0.2	PC	GY
Turkey	0.33	0.35	BC	Tbill
United Kingdom	0.22	0	M2	-
USA	0.08	0	M1	-

Note: "-" indicates no variable had significant predictive content.

Appendix C: Results from Test of Valued-Added of Best Quantity, 4 Quarters Ahead

Table C1: Marginal Information of Best Quantity over Best Price for Predicting GDP Growth and Inflation (1990–2003)

	GDP	Inflation	GDP	Inflation
Argentina	0.00	0.06	-	M1
Australia	0.00	0.00	-	-
Austria	0.12	0.18	M1	M2
Belgium	0.00	0.00	-	-
Brazil	0.12	0.21	M2	M1
Canada	0.15	0.10	M2	M1
Chile	0.00	0.00	-	-
Denmark	0.00	0.33	-	BC
Finland	0.00	0.00	-	-
France	0.00	0.00	-	-
Germany	0.00	0.44	-	BC
Greece	0.00	0.02	-	M2
Ireland	0.00	0.00	-	-
Israel	0.16	0.05	M1	M1
Italy	0.12	0.07	PC	M1
Japan	0.00	0.32	-	PC
Malaysia	0.00	0.37	-	PC
Mexico	0.00	0.11	-	M1
Netherlands	0.00	0.31	-	PC
New Zealand	0.00	0.35	-	M1
Norway	0.12	0.03	M1	M1
Philippines	0.10	0.52	M1	M2
South Africa	0.10	0.15	M1	M2
Spain	0.40	0.00	M1	-
Sweden	0.13	0.00	PC	-
Switzerland	0.12	0.16	M1	PC
Turkey	0.00	0.61	-	BC
United Kingdom	0.00	0.20	-	M2
USA	0.00	0.09	-	M1

Note: "-" indicates quantity variable had no significant value-added.

Appendix D: Results from Augmented AR Regressions, 8 Quarters Ahead

Table D1: Measure of Marginal Information for Best Quantity and Price Variable for Predicting GDP Growth (1990–2003)

	Quantity var	Price var	Best quantity	Best price
Argentina	0	0	-	-
Australia	0.81	0.31	M2	P-L
Austria	0.28	0.36	PC	ST
Belgium	0	0.3	-	ST
Brazil	0.11	0	PC	-
Canada	0.22	0.2	M1	GY
Chile	0.3	0.26	BC	ST
Denmark	0.25	0.11	PC	ST
Finland	0.6	0.17	PC	Tbill
France	0.27	0.33	M2	ST
Germany	0	0.57	-	Tbill
Greece	0	0.19	-	P-L
Ireland	0.2	0.19	M1	ST
Israel	0.29	0	BC	-
Italy	0.38	0.33	PC	ST
Japan	0.26	0	M2	-
Malaysia	0.15	0	PC	-
Mexico	0	0	-	-
Netherlands	0.58	0.47	PC	Tbill
New Zealand	0.18	0	M2	-
Norway	0.36	0.16	PC	ST
Philippines	0.14	0.37	M1	GY
South Africa	0.11	0	M1	-
Spain	0.57	0.37	M1	ST
Sweden	0.32	0.43	PC	ST
Switzerland	0.6	0.25	M1	ST
Turkey	0	0.37	-	Tbill
United Kingdom	0.51	0.32	PC	GY
USA	0	0.17	-	ST

Note: "-" indicates no variable had significant predictive content.

Table D2: Measure of Marginal Information for Best Quantity and Price Variable for Predicting Inflation Growth (1990–2003)

	Quantity var	Price var	Best quantity	Best price
Argentina	0.21	0	BC	-
Australia	0.29	0.26	M1	P-L
Austria	0.31	0.23	M2	Tbill
Belgium	0.07	0.12	M1	ST
Brazil	0.21	0	M1	-
Canada	0	0.5	-	P-L
Chile	0	0	-	-
Denmark	0.41	0.24	BC	P-L
Finland	0.18	0	PC	-
France	0	0.06	-	GY
Germany	0.56	0.51	BC	Tbill
Greece	0.03	0.02	PC	ST
Ireland	0	0	-	-
Israel	0.06	0	M1	-
Italy	0.14	0.17	M1	P-L
Japan	0.38	0	PC	-
Malaysia	0.48	0.09	M1	ST
Mexico	0.19	0	M1	-
Netherlands	0.78	0.81	M2	P-L
New Zealand	0.27	0	M2	-
Norway	0.28	0.36	PC	P-L
Philippines	0.25	0	PC	-
South Africa	0	0.19	-	ST
Spain	0.05	0	PC	-
Sweden	0	0	-	-
Switzerland	0.24	0.13	PC	Tbill
Turkey	0.14	0.09	BC	Tbill
United Kingdom	0.26	0	M2	-
USA	0.16	0	M1	-

Note: "-" indicates no variable had significant predictive content.

Appendix E: Results from Test of Valued-Added of Best Quantity, 8 Quarters Ahead

Table E1: Marginal Information of Best Quantity over Best Price for Predicting GDP Growth and Inflation (1990–2003)

	GDP	Inflation	GDP	Inflation
Argentina	0.00	0.21	-	BC
Australia	0.05	0.24	M2	M1
Austria	0.29	0.28	M2	M2
Belgium	0.00	0.00	-	-
Brazil	0.08	0.21	M2	M1
Canada	0.16	0.00	M2	-
Chile	0.00	0.01	-	BC
Denmark	0.00	0.49	-	BC
Finland	0.04	0.11	PC	PC
France	0.14	0.00	M1	-
Germany	0.00	0.22	-	BC
Greece	0.00	0.04	-	PC
Ireland	0.13	0.00	PC	-
Israel	0.00	0.06	-	M1
Italy	0.15	0.11	M2	M1
Japan	0.00	0.38	-	PC
Malaysia	0.00	0.48	-	M1
Mexico	0.00	0.19	-	M1
Netherlands	0.00	0.31	-	M2
New Zealand	0.19	0.27	M1	M2
Norway	0.18	0.41	M1	PC
Philippines	0.00	0.79	-	PC
South Africa	0.04	0.00	M1	-
Spain	0.35	0.05	M2	PC
Sweden	0.13	0.00	PC	-
Switzerland	0.06	0.19	M1	PC
Turkey	0.00	0.38	-	BC
United Kingdom	0.07	0.14	M2	M2
USA	0.00	0.09	-	M1

Note: "-" indicates quantity variable had no significant value-added.

Appendix F: Measures of Financial Development, Structure, Regulation, and Legal Flexibility

Table F1: Financial Development, Financial Structure, and Financial Regulation (Levine 2002), and Legal Flexibility (Ergungor 2003)

Country	Financial development	Financial organization	Financial regulation	Legal flexibility
Argentina	Less	Bank	Light	Low
Australia	More	Market	Light	High
Austria	More	Bank	Light	Low
Belgium	Less	Bank	Heavy	High
Brazil	Less	Market	Heavy	Low
Canada	More	Market	Light	High
Chile	Less	Bank	Heavy	High
Denmark	More	Market	Light	High
Finland	More	Bank	Light	High
France	More	Bank	Light	Low
Germany	More	Market	Light	Low
Greece	Less	Bank	Heavy	Low
Ireland	More	Market	Light	High
Israel	More	Market	Heavy	Low
Italy	Less	Bank	Heavy	Low
Japan	More	Market	Heavy	Low
Malaysia	More	Market	Heavy	High
Mexico	Less	Market	Heavy	Low
Netherlands	More	Market	Light	High
New Zealand	More	Market	Light	High
Norway	More	Bank	Light	High
Philippines	Less	Market	Light	Low
South Africa	More	Market	Light	High
Spain	More	Bank	Light	Low
Sweden	More	Market	Heavy	High
Switzerland	More	Market	Light	Low
Turkey	Less	Market	Heavy	Low
U.K.	More	Market	Light	High
USA	More	Market	Heavy	High

Note: Comparisons are relative to the average of the total sample in each study.

The ***financial development*** category is determined using the financial development indexes in Levine (2002). The financial development indexes consist of the following three indexes:

(i) *Finance-Activity = ln (total value traded ratio * private credit ratio)*
(ii) *Finance-Size = ln (market capitalization ratio + private credit ratio)*
(iii) *Finance-Efficiency = ln (total value traded ratio / overhead costs)*

Sample averages are taken for each index to compute the three financial development indexes for each country. Based on the most frequent reading of the three indexes for each country, we construct the overall financial development index.

The ***financial organization*** category is constructed from the financial structure indexes in Levine (2002). The financial structure indexes consist of the following three indexes:

(i) *Structure-Activity = ln (total value traded ratio / bank credit ratio)*
(ii) *Structure-Size = ln (market capitalization ratio / bank credit ratio)*
(iii) *Structure-Efficiency = ln (total value traded ratio * overhead costs)*

These indexes are constructed using data from 48 countries over various subsamples covering the period 1980 to 1995. Sample averages are taken for each index to compute the three financial structure indexes for each country. Based on the most frequent reading of the three indexes for each country, the overall financial structure index was constructed, as reported in Table F1.

The ***financial regulation*** category is determined from the index of financial regulation of commercial banks in Levine (2002). This index is based on survey data, which determines whether national regulators allow commercial banks to own non-financial firms or to participate in the following activities: securities (e.g., underwriting, brokering); insurance (e.g., selling, underwriting); and real estate (e.g., investment, development, management). The index is a sum of scores for each component, which are given depending on the degree of permissiveness (1 = unrestricted; 2 = allowed with some restrictions; 3 = restricted). As with financial organization and financial development, we

make classifications between "light" and "heavy" by comparing individual country scores relative to the total sample average.

The ***legal flexibility*** category is taken from Ergungor (2003) to classify countries as having "high" or "low" legal flexibility relative to the sample average (the sample covers 48 countries). A system may be classified as having low flexibility if complaints and rulings must be justified by statutory law, or if a judge may not justify their judgment according to their conscience (in equity).

Appendix G: Sorting of Results by Financial and Legal System Type, 4 Quarters Ahead

Table G1: GDP Growth, 4 Quarters Ahead

					GDP				
Country	Legal flexibility	Financial development	Financial organization	Financial regulation	Information in:	Best indicator	Quantity variable	Best quantity given best price	Price variable
Greece	low	less	bank	heavy	price	price			stock index
Italy	low	less	bank	heavy	both	quantity	credit	credit	gov rate
Belgium	high	less	bank	heavy	quantity	quantity	money		
Chile	high	less	bank	heavy	both	price	credit		stock index
Argentina	low	less	bank	light	neither	neither			
Brazil	low	less	market	heavy	quantity	quantity	credit	money	
Mexico	low	less	market	heavy	neither	neither			
Turkey	low	less	market	heavy	price	price			gov rate
Philippines	low	less	market	light	both	price	money	money	gov rate
Austria	low	more	bank	light	both	quantity	money	money	stock index
France	low	more	bank	light	both	quantity	money		gov rate
Spain	low	more	bank	light	both	quantity	money		stock index
Finland	high	more	bank	light	both	quantity	credit		gov rate
Norway	high	more	bank	light	quantity	quantity	credit	money	
Israel	low	more	market	heavy	quantity	quantity	money	money	
Japan	low	more	market	heavy	quantity	quantity	money		
Malaysia	high	more	market	heavy	neither	neither			
Sweden	high	more	market	heavy	both	price	credit	credit	stock index
USA	high	more	market	heavy	price	price			stock index
Germany	low	more	market	light	both	price	credit		gov rate
Switzerland	low	more	market	light	both	quantity	money	money	policy rate
Australia	high	more	market	light	both	quantity	money		policy rate
Canada	high	more	market	light	quantity	quantity	money	money	
Denmark	high	more	market	light	quantity	both	money		
Ireland	high	more	market	light	both	price	money		stock index
Netherlands	high	more	market	light	both	price	credit		gov rate
New Zealand	high	more	market	light	neither	neither			
South Africa	high	more	market	light	quantity	quantity	money	money	
U.K.	high	more	market	light	both	quantity	credit		gov rate

Table G2: Inflation, 4 Quarters Ahead

						Inflation				
Country	Legal flexibility	Financial development	Financial organization	Financial regulation		Information in	Best indicator	Quantity variable	Best quantity given best price	Price variable
Greece	low	less	bank	heavy		quantity	quantity	credit	money	
Italy	low	less	bank	heavy		both	quantity	money	money	policy rate
Belgium	high	less	bank	heavy		price	price			stock index
Chile	high	less	bank	heavy		neither	neither			
Argentina	low	less	bank	light		quantity	quantity	money	money	
Brazil	low	less	market	heavy		quantity	quantity	money	money	
Mexico	low	less	market	heavy		quantity	quantity	money	money	
Turkey	low	less	market	heavy		both	price	credit	credit	gov rate
Philippines	low	less	market	light		both	quantity	money	money	gov rate
Austria	low	more	bank	light		both	quantity	money	money	gov rate
France	low	more	bank	light		price	price			gov rate
Spain	low	more	bank	light		neither	neither			
Finland	high	more	bank	light		quantity	quantity	credit		
Norway	high	more	bank	light		quantity	quantity	money	money	
Israel	low	more	market	heavy		quantity	quantity	money	money	
Japan	low	more	market	heavy		quantity	quantity	credit	credit	
Malaysia	high	more	market	heavy		quantity	quantity	credit	credit	
Sweden	high	more	market	heavy		neither	neither			
USA	high	more	market	heavy		quantity	quantity	money	money	
Germany	low	more	market	light		both	quantity	credit	credit	gov rate
Switzerland	low	more	market	light		both	price	credit	credit	gov rate
Australia	high	more	market	light		both	price	money		policy rate
Canada	high	more	market	light		both	price	money	money	policy rate
Denmark	high	more	market	light		quantity	quantity	credit	credit	
Ireland	high	more	market	light		price	price			gov rate
Netherlands	high	more	market	light		both	quantity	money	credit	gov rate
New Zealand	high	more	market	light		quantity	quantity	money	money	
South Africa	high	more	market	light		both	price	money	money	gov rate
U.K.	high	more	market	light		quantity	quantity	money	money	

Appendix H: Sorting of Results by Financial and Legal System Type, 8 Quarters Ahead

Table H1: GDP Growth, 8 Quarters Ahead

					GDP				
Country	Legal flexibility	Financial development	Financial organization	Financial regulation	Information in:	Best indicator	Quantity variable	Best quantity given best price	Price variable
Greece	low	less	bank	heavy	price	price			policy rate
Italy	low	less	bank	heavy	both	quantity	credit	money	stock index
Belgium	high	less	bank	heavy	price	price			stock index
Chile	high	less	bank	heavy	both	quantity	credit	money	stock index
Argentina	low	less	bank	light	neither	neither			
Brazil	low	less	market	heavy	quantity	quantity	credit	money	
Mexico	low	less	market	heavy	neither	neither			
Turkey	low	less	market	heavy	price	price			gov rate
Philippines	low	less	market	light	both	price	money		gov rate
Austria	low	more	bank	light	both	price	credit	money	stock index
France	low	more	bank	light	both	price	credit	money	stock index
Spain	low	more	bank	light	both	quantity	money	money	stock index
Finland	high	more	bank	light	both	quantity	credit	credit	gov rate
Norway	high	more	bank	light	quantity	quantity	credit	money	stock index
Israel	low	more	market	heavy	quantity	quantity	credit		
Japan	low	more	market	heavy	quantity	quantity	money		
Malaysia	high	more	market	heavy	quantity	quantity	credit		
Sweden	high	more	market	heavy	both	price	credit	credit	stock index
USA	high	more	market	heavy	price	price			stock index
Germany	low	more	market	light	price	price			gov rate
Switzerland	low	more	market	light	both	quantity	money	money	stock index
Australia	high	more	market	light	both	quantity	money	money	policy rate
Canada	high	more	market	light	both	quantity	money	money	gov rate
Denmark	high	more	market	light	both	quantity	money		stock index
Ireland	high	more	market	light	both	quantity	money	credit	stock index
Netherlands	high	more	market	light	both	quantity	credit		stock index
New Zealand	high	more	market	light	quantity	quantity	money	money	
South Africa	high	more	market	light	quantity	quantity	money	money	
U.K.	high	more	market	light	both	quantity	money	money	gov rate

Table H2: Inflation, 8 Quarters Ahead

					Inflation				
Country	Legal flexibility	Financial development	Financial organization	Financial regulation	Information in:	Best indicator	Quantity variable	Best quantity given best price	Price variable
Greece	low	less	bank	heavy	both	quantity	credit	credit	stock index
Italy	low	less	bank	heavy	both	price	money	money	policy rate
Belgium	high	less	bank	heavy	both	price	money		stock index
Chile	high	less	bank	heavy	neither	neither			
Argentina	low	less	bank	light	quantity	quantity	credit	credit	
Brazil	low	less	market	heavy	quantity	quantity	money	money	
Mexico	low	less	market	heavy	quantity	quantity	money	money	
Turkey	low	less	market	heavy	both	quantity	credit	credit	gov rate
Philippines	low	less	market	light	quantity	quantity	credit	credit	
Austria	low	more	bank	light	both	quantity	money	money	gov rate
France	low	more	bank	light	price	price			gov rate
Spain	low	more	bank	light	quantity	quantity	credit	credit	
Finland	high	more	bank	light	quantity	quantity	credit	credit	
Norway	high	more	bank	light	both	price	credit	credit	policy rate
Israel	low	more	market	heavy	quantity	quantity	money	money	
Japan	low	more	market	heavy	quantity	quantity	credit	credit	
Malaysia	high	more	market	heavy	both	quantity	money	money	stock index
Sweden	high	more	market	heavy	neither	neither			
USA	high	more	market	heavy	quantity	quantity	money	money	
Germany	low	more	market	light	both	quantity	credit	credit	gov rate
Switzerland	low	more	market	light	both	quantity	credit	credit	gov rate
Australia	high	more	market	light	both	quantity	money	money	policy rate
Canada	high	more	market	light	price	price			policy rate
Denmark	high	more	market	light	both	quantity	credit	credit	policy rate
Ireland	high	more	market	light	neither	neither			
Netherlands	high	more	market	light	both	price	money	money	policy rate
New Zealand	high	more	market	light	quantity	quantity	money	money	
South Africa	high	more	market	light	price	price			stock index
U.K.	high	more	market	light	quantity	quantity	money	money	

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